

7. Predict the sign of each product.

When 2 rational numbers have the same sign, their product is positive.

When 2 rational numbers have opposite signs, their product is negative.

Then, use fraction multiplication to determine the numerical value of the product.

$$\text{a) } \left(-\frac{1}{3}\right)\left(\frac{2}{5}\right)$$

The product is negative.

$$\begin{aligned}\left(-\frac{1}{3}\right)\left(\frac{2}{5}\right) &= \frac{1 \times 2}{3 \times 5} \\ &= \frac{2}{15}\end{aligned}$$

$$\text{So, } \left(-\frac{1}{3}\right)\left(\frac{2}{5}\right) = -\frac{2}{15}$$

$$\text{b) } \left(\frac{1}{4}\right)\left(-\frac{3}{5}\right)$$

The product is negative.

$$\begin{aligned}\left(\frac{1}{4}\right)\left(-\frac{3}{5}\right) &= \frac{1 \times 3}{4 \times 5} \\ &= \frac{3}{20}\end{aligned}$$

$$\text{So, } \left(\frac{1}{4}\right)\left(-\frac{3}{5}\right) = -\frac{3}{20}$$

$$\text{c) } \left(\frac{4}{5}\right)\left(\frac{1}{2}\right)$$

The product is positive.

Simplify before multiplying.

$$\begin{aligned}\left(\frac{4}{5}\right)\left(\frac{1}{2}\right) &= \frac{\overset{2}{\cancel{4}} \times 1}{5 \times \overset{1}{\cancel{2}}} \\ &= \frac{2}{5}\end{aligned}$$

$$\text{So, } \left(\frac{4}{5}\right)\left(\frac{1}{2}\right) = \frac{2}{5}$$

$$\text{d) } \left(-\frac{5}{6}\right)\left(-\frac{2}{3}\right)$$

The product is

positive.

Simplify before multiplying.

$$\begin{aligned}\left(-\frac{5}{6}\right)\left(-\frac{2}{3}\right) &= \frac{5 \times \overset{2}{\cancel{2}}}{\overset{3}{\cancel{6}} \times 3} \\ &= \frac{5}{9}\end{aligned}$$

$$\text{So, } \left(-\frac{5}{6}\right)\left(-\frac{2}{3}\right) = \frac{5}{9}$$

9. Write each change in value as the product: price per share
- $\times$
- number of shares

Use a calculator. A positive product represents an increase in value. A negative product represents a decrease in value.

$$\text{a) Change in value: } 120 \times (-0.8) = -96$$

The value of shares dropped by \$96.

$$\text{b) Change in value: } 50 \times (-2.10) = -105$$

The value of shares dropped by \$105.

$$\text{c) Change in value: } 65 \times 0.23 = 14.95$$

The value of shares increased by \$14.95.

10. Write the change in depth as the product: average speed per minute
- $\times$
- number of minutes

Since the diver is descending, her average speed is negative.

$$\text{Change in depth after 3.6 min: } (-10.4) \times 3.6 = -37.44$$

After 3.6 min, the diver descended 37.44 m.

12. Predict the sign of each product. When 2 rational numbers have the same sign, their product is positive.

When 2 rational numbers have opposite signs, their product is negative.

Then, use fraction multiplication to determine the numerical value of each product. Simplify before multiplying when needed.

$$\text{a) } \left(\frac{5}{4}\right)\left(-\frac{16}{5}\right)$$

The product is negative since the rational numbers have opposite signs.

$$\begin{aligned}\frac{\overset{1}{\cancel{5}}}{4} \times \frac{\overset{4}{\cancel{16}}}{\overset{1}{\cancel{5}}} &= \frac{1}{1} \times \frac{4}{1} \\ &= 4\end{aligned}$$

$$\text{So, } \left(\frac{5}{4}\right)\left(-\frac{16}{5}\right) = -4$$

$$\text{b) } \left(-\frac{2}{3}\right)\left(-\frac{5}{6}\right)$$

The product is positive since the rational numbers have the same sign.

$$\begin{aligned}\frac{\overset{1}{\cancel{2}}}{3} \times \frac{5}{\overset{3}{\cancel{6}}} &= \frac{1}{3} \times \frac{5}{3} \\ &= \frac{5}{9}\end{aligned}$$

$$\text{So, } \left(-\frac{2}{3}\right)\left(-\frac{5}{6}\right) = \frac{5}{9}$$

c)  $\left(-2\frac{8}{9}\right)\left(5\frac{1}{8}\right)$

The product is negative since the rational numbers have opposite signs.

Write each mixed number as an improper fraction.

$$\begin{aligned} 2\frac{8}{9} \times 5\frac{1}{8} &= \frac{13}{9} \times \frac{41}{8} \\ &= \frac{13}{9} \times \frac{41}{4} \\ &= \frac{533}{36} \\ &= 14\frac{29}{36} \end{aligned}$$

So,  $\left(-2\frac{8}{9}\right)\left(5\frac{1}{8}\right) = -14\frac{29}{36}$

d)  $\left(-4\frac{2}{5}\right)\left(-\frac{5}{3}\right)$

The product is positive since the rational numbers have the same sign.

Write  $4\frac{2}{5}$  as an improper fraction.

$$\begin{aligned} 4\frac{2}{5} \times \frac{5}{3} &= \frac{22}{5} \times \frac{5^1}{3} \\ &= \frac{22}{1} \times \frac{1}{3} \\ &= \frac{22}{3} \\ &= 7\frac{1}{3} \end{aligned}$$

So,  $\left(-4\frac{2}{5}\right)\left(-\frac{5}{3}\right) = 7\frac{1}{3}$

14. a) Write the cost in dollars of painting the trucks as a product: average cost per truck  $\times$  number of trucks

The average cost per truck is negative because it is money that the company pays.

Then,  $(-3457.25) \times 25 = -86\,431.25$

It costs \$86 431.25 to repaint all the trucks.

- b)  $45\,567.87 - 86\,431.25 = -40\,863.38$

The company's bank account is overdrawn by \$40 863.38 after the bill for painting has been paid.

16. To determine the numerical value of each missing number, use the fact that multiplication and division are inverse operations.

- a) The sign of the missing number is negative because the product of 2 negative numbers is positive.

Use division to determine the numerical value.

$$\begin{aligned} \square &= 15.275 \div 3.25 \\ &= 4.7 \end{aligned}$$

The missing number is  $-4.7$ .

- b) The sign of the missing number is positive because the product of a negative number and a positive number is negative.

Use division to determine the numerical value.

$$\begin{aligned} \square &= \frac{35}{8} \div \frac{5}{4} \\ &= \frac{35}{8} \div \frac{10}{8} \\ &= \frac{35}{10} \\ &= \frac{7}{2} \end{aligned}$$

The missing number is  $\frac{7}{2}$ .

- c) The sign of the missing number is negative because the product of a negative number and a positive number is negative.

Use division to determine the numerical value.

$$\begin{aligned} \square &= 0.018 \div 0.045 \\ &= 0.4 \end{aligned}$$

The missing number is  $-0.4$ .

- d) The sign of the missing number is positive because the product of 2 positive numbers is positive.

Use division to determine the numerical value.

$$\begin{aligned} \square &= 5\frac{1}{4} \div 3\frac{3}{4} \\ &= \frac{21}{4} \div \frac{15}{4} \\ &= \frac{21}{15} \\ &= \frac{7}{5} \\ &= 1\frac{2}{5} \end{aligned}$$

The missing number is  $1\frac{2}{5}$ .

17. Choose a pair of rational numbers. For the product to be closer to 0 than both of these numbers, the rational numbers must be between  $-1$  and  $1$ . For example,

$$(-0.4)(0.5) = -0.2$$

$$(0.4)(-0.5) = -0.2$$

For each product statement, the product is closer to 0 than either factor is.

Choose a pair of rational numbers where one number is greater than 1. For example:

$$(1.4)(-0.5) = -0.7$$

The product is closer to 0 than 1.4 is.

Choose a pair of rational numbers where one number is less than  $-1$ . For example,

$$(-1.4)(0.5) = -0.7$$

The product is closer to 0 than  $-1.4$  is.

Choose pairs of rational numbers where both numbers are greater than or less than 1. For example,

$$(-1.4)(-1.5) = 2.1 \text{ and } (1.4)(1.5) = 2.1$$

Neither product is closer to 0 than either of the two factors is.